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In the Claims

1. (Original) A method of identifying load and motor fault information in a condition monitoring system comprising the steps of:

simultaneously sampling voltage and current data of an induction machine in operation;

determining an indicator of reactive power from a portion of the sampled voltage and current data; and

determining an internal motor fault using the indicator of reactive power.

- 2. (Original) The method of claim 1 further comprising the steps of determining an indicator of real power from another portion of the sampled voltage and current data and determining a load fault from the indicator of real power.
- 3. (Original) The method of claim 2 further comprising the step of determining a frequency spectrum of real power and a frequency spectrum of reactive power.
- 4. (Original) The method of claim 3 further comprising the steps of analyzing the frequency spectrum of reactive power to determine a motor fault and analyzing the frequency spectrum of the indicator of real power to determine a load fault.
- 5. (Original) The method of claim 4 wherein the load fault includes a motor driven fault.
- (Original) The method of claim 1 further comprising the steps of: determining two-phase voltages and two-phase current values from the sampled voltage and current data;

determining a reference frame transformation angle from the two-phase voltage values; and

transforming the two-phase current values and the two-phase voltage values to a rotating reference.

7. (Original) The method of claim 1 wherein the reactive power is an instantaneous reactive power.

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8. (Original) An induction motor monitoring system comprising:
at least one voltage sensor and at lease one current sensor; and
a controller connected to the at least one voltage and the at least one current
sensors and configured to:

receive voltage and current data from the at least one voltage and the at least one current sensor;

determine instantaneous reactive power from the voltage and current data;

generate a frequency spectrum of the instantaneous reactive power; and determine a motor fault from at least the frequency spectrum.

- 9. (Original) The system of claim 8 wherein the at least one voltage sensor includes a pair of voltage sensors configured to acquire line-line voltages of two phases of an induction motor and wherein the at least one current sensor includes a pair of current sensors configured to acquire line-line currents of the two phases of the induction motor and wherein the controller is further configured to determine two-phase voltage and two-phase current values from the voltage and current data.
- 10. (Original) The system of claim 9 wherein the controller is further configured to determine a reference frame transformation angle and apply a reference frame transform to transform the two-phase voltage and the two-phase current values to a rotating reference using the reference frame transformation angle.
- 11. (Original) The system of claim 10 wherein the controller is further configured to determine the instantaneous reactive power from the transformed two-phase voltage and the transformed two-phase current values.
- 12. (Original) The system of claim 11 wherein the controller is further configured to determine an instantaneous real power value from the transformed two-phase voltage and the transformed two-phase current values.

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13. (Original) An apparatus to distinguish betwe n a motor fault and a load fault in an AC induction motor, the apparatus comprising:

at least two current sensors for obtaining at least two AC motor current signals; at least two voltage sensors for obtaining at least two AC motor voltage signals;

an analog-to-digital converter for converting the at least two AC motor current signals to digitized current signals and the at least two AC motor voltage signals to digitized voltage signals; and

a microprocessor to receive the digitized signals and compare instantaneous reactive power values to a set of baseline reactive power values to determine a motor fault in the motor.

- 14. (Original) The apparatus of claim 13 wherein the microprocessor computes a frequency spectrum of the instantaneous reactive power values and compares the frequency spectrum to a baseline reactive power frequency spectrum to determine the motor fault.
- 15. (Original) The apparatus of claim 13 wherein the microprocessor applies a reference frame transformation to the digitized signals prior to calculating the instantaneous reactive power values.
- 16. (Original) The apparatus of claim 13 wherein the processor calculates instantaneous real power values from the digitized signals and compares the instantaneous real power values to a set of baseline real power values to determine a motor-driven fault in the AC motor.
- 17. (Original) The apparatus of claim 16 wherein the processor computes a frequency spectrum of the instantaneous real power values and compares the frequency spectrum to a baseline real power frequency spectrum to determine the motor driven fault.
- 18. (Original) A computer readable storage medium having a computer program stored thereon to determine faults in an AC induction motor and representing a set of instructions that when executed by a computer causes the computer to:

model operation of an AC motor having a load thereon and known to be operating normally and determine baseline operation therefrom;

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time current data;

acquire real-time voltage and real-time current data of the ΛC motor in operation; determine reactive power of the ΛC motor from the real time voltage and real-

compare the reactive power to the baseline operation; and determine presence of fault conditions in the AC motor from at least the comparison.

- 19. (Original) The computer readable storage medium of claim 18 wherein the set of instructions further causes the computer to issue a warning if a fault condition is found to be present in the AC motor.
- 20. (Original) The computer readable storage medium of claim 18 wherein the set of instructions further causes the computer to apply a reference frame transform to the real-time voltage and real-time current data.
- 21. (Original) The computer readable storage medium of claim 18 wherein the set of instructions further causes the computer to generate a frequency spectrum of the reactive power and display the frequency spectrum on a console for visual analysis by a user.
- 22. (Original) The computer readable storage medium of claim 21 wherein the set of instructions further causes the computer to display the frequency spectrum of the reactive power relative to a frequency spectrum of the baseline operation to visually indicate a fault condition in the AC motor.
- 23. (Original) A motor fault detector for an AC induction motor, the detector comprising:

means for acquiring voltage and current data of an AC motor in operation;

means for determining instantaneous reactive power in the AC motor from the voltage and current data; and

means for determining an internal fault in the AC motor from the instantaneous reactive power.